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EGG MORPHOLOGY OF SOME NOCTUIDAE (LEPIDOPTERA)

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Egg Morphology of Some Noctuidae (Lepidoptera). Dolinskaya, I. V. — The eggs of 10 species Noctuidae from 6 subfamilies (Acronictinae, Metoponiinae, Cuculliinae, Heliothinae, Condicinae and Bryophilinae) occurring in Ukraine are examined, described, and illustrated with SEM. The diagnostic characters of examined species are carried out.

K e y w o r d s: Noctuidae, Lepidoptera, egg, description, diagnostic characters, scanning electron microscopy, Ukraine.

Морфология яиц некоторых совок (Lepidoptera, Noctuidae). Долинская И. В. — С помощью сканирующего электронного микроскопа изучены, описаны и проиллюстрированы яйца 10 видов совок из 6 подсемейств (Acronictinae, Metoponiinae, Cuculliinae, Heliothinae, Condicinae и Bryophilinae), встречающихся в Украине. Выделены диагностические признаки для исследованных видов.

К л ю ч е в ы е с л о в а: Noctuidae, Lepidoptera, яйцо, описание, диагностические признаки, сканирующая электронная микроскопия, Украина.

Introduction

This paper continues a series of articles devoted to the morphology of eggs of noctuids (Dolinskaya, 2010, 2011; Dolinskaya, Geryak, 2010; Dolinskaya, Ponomarenko, 2013). Before this study the detailed line drawings of eggs obtained with the use of an optical microscope and belonging to four species (*Acronicta megacephala, A. rumicis, Craniophora ligustri* and *Cucullia umbratica*) have been published by Döring (1955). A thorough examination of the chorionic structure can be achieved with the use of SEM. Analysis of the discovers show numerous diagnostic characters not considered before.

Material and methods

This study is based on the materials collected by the author in Ukraine. Eggs of three species Acronictinae (*Acronicta megacephala, A. rumicis, Craniophora ligustri)*, one species Metoponiinae *(Tyta luctuosa)*, two species Cuculliinae *(Cucullia xeranthemi*, *C. umbratica)*, two species Heliothinae (*Heliothis maritima, Helicoverpa armigera)*, one species Condicinae (*Eucarta amethystina*) and one species Bryophilinae (*Cryphia fraudatricula*) author were examined. The eggs were obtained from females captured in the field. The eggs of *Cucullia umbratica* were withdrawn from abdomen of dry females. The eggs were examined with the use of scanning electron microscopy (SEM). Terminology of the egg morphology follows Salkeld (1984), and systematic arrangement is given according to Fibiger, Hacker (2004).

Acronicta megacephala ([Denis et Schiffermüller], 1775)

D e s c r i p t i o n. Egg subspherical, flattened (fig. 1), height 0.35–0.4 mm, diameter 1.1–1.2 mm (n = 2). Egg light green with purple spot at apical part and smaller spots around the egg. Chorion white, translucent.

Chorion ridged, marked on two-thirds of surfaces. Micropylar area clearly expressed, represented by rosette and 4 rows of petalled cells (fig. 2). Rosette with 13–15 cells. Walls cells elevated. Central portion of rosette with round depression. (fig. 3). There are 30 of 73–76 longitudinal ridges radiating from cells of fourth row. Longest ridges unevenly wavy

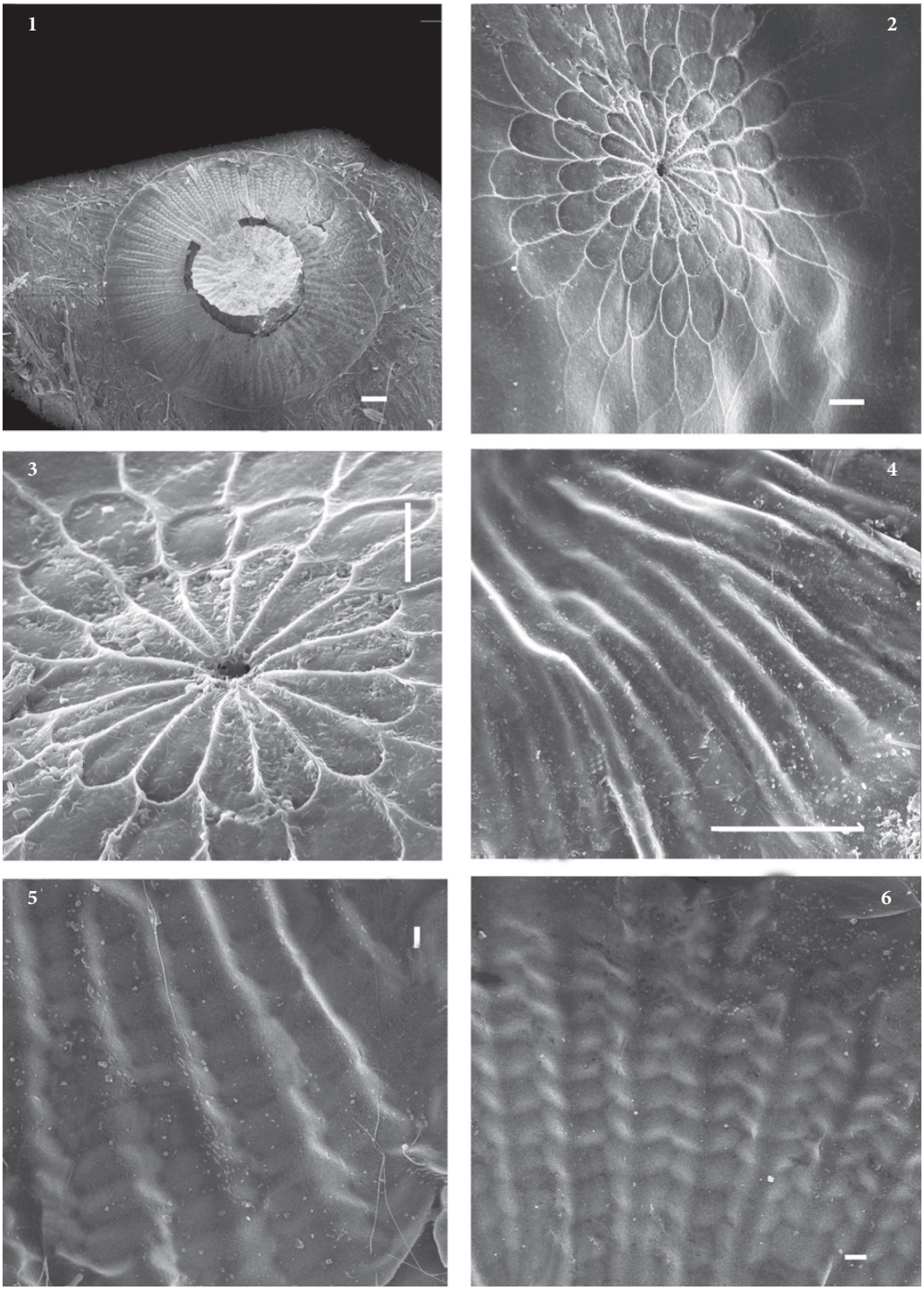

Fig. 1–6. Eggs of Acronictinae: *Acronicta megacephala*. Scale bars: 1, 4 — 100 μm; 2, 3, 5, 6 — 10 μm.

Рис. 1–6. Яйца Acronictinae: *Acronicta megacephala*. Масштабные линейки: 1, 4 — 100 мкм; 2, 3, 5, 6 — 10 мкм.

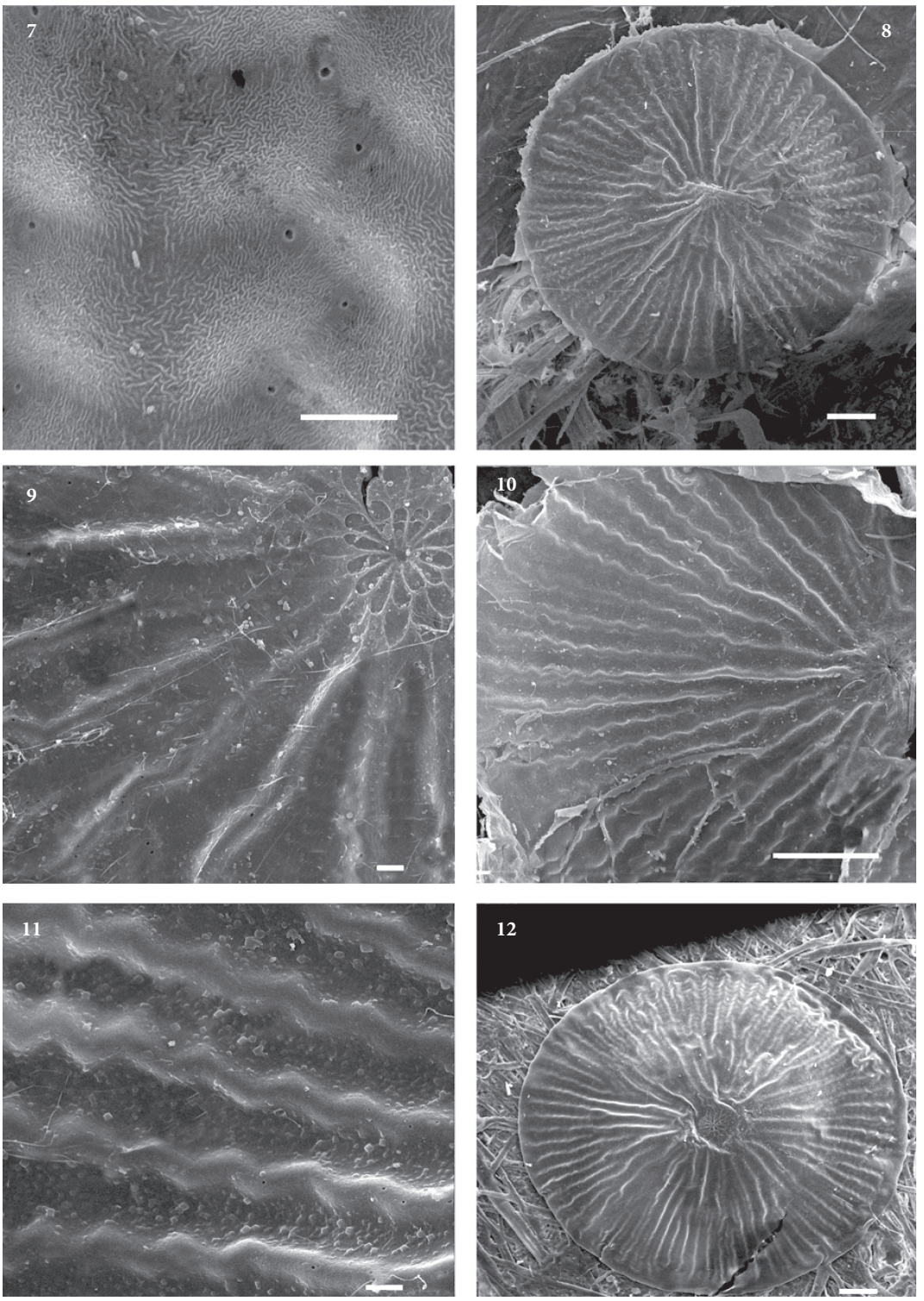

Fig. 7–12. Eggs of Acronictinae: 7 — *Acronicta megacephala*; 8–11 — *Acronicta rumicis*; 12 — *Craniophora ligustri*. Scale bars: 8, 10, 12 — 100 μm; 7, 9, 11 — 10 μm.

Рис. 7–12. Яйца Acronictinae: 7 — *Acronicta megacephala*; 8–11 — *Acronicta rumicis*; 12 — *Craniophora ligustri*. Масштабные линейки 8, 10, 12 — 100 мкм; 7, 9, 11 — 10 мкм.

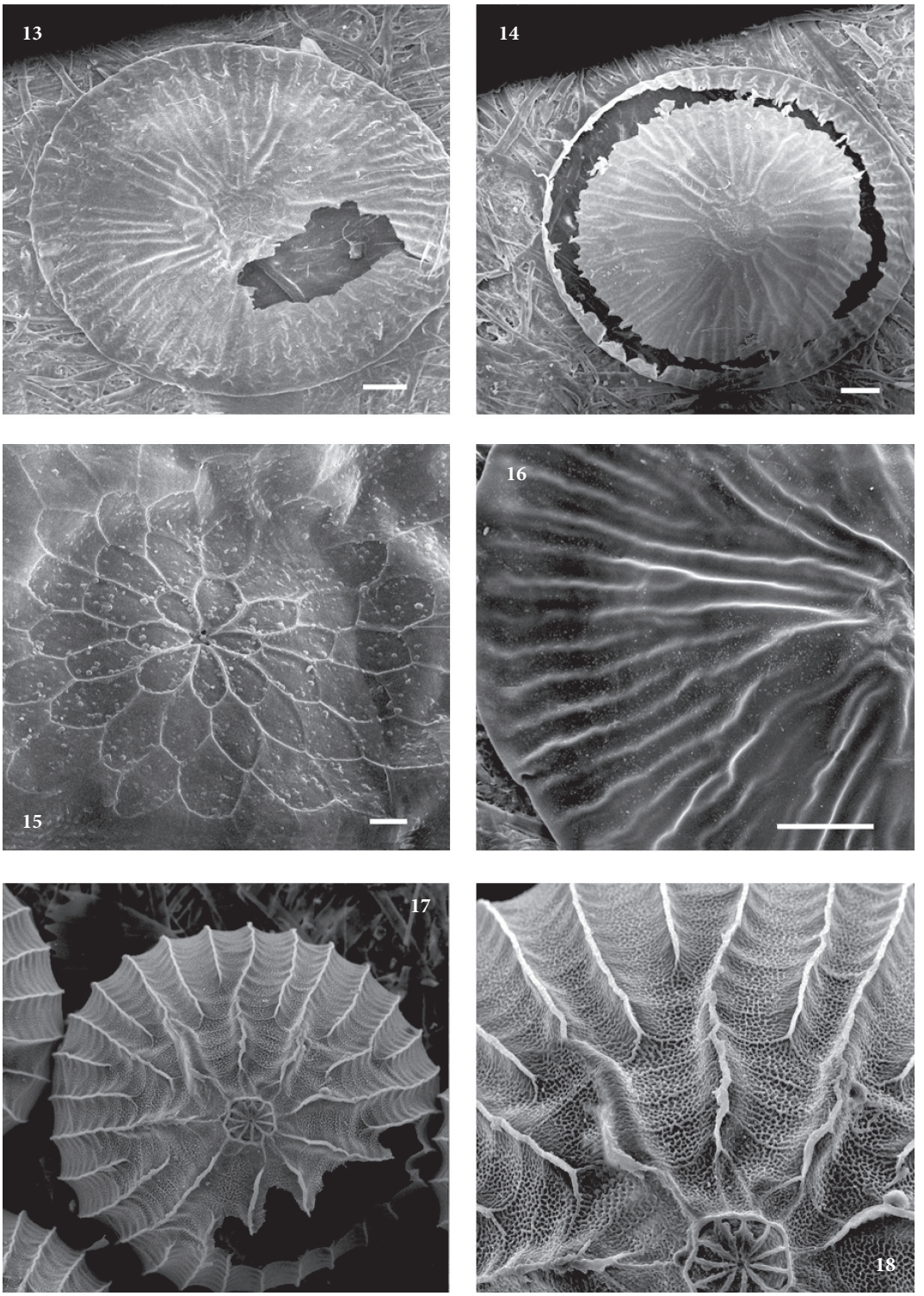

Fig. 13–18. Eggs of Acronictinae: 13–16 — *Craniophora ligustri*; eggs of Metoponiinae: 17, 18 — *Tyta luctuosa*. Scale bars: 13, 14, 16–18 — 100 μm; 15 — 10 μm.

Рис. 13–18. Яйца Acronictinae: 13–16 — *Craniophora ligustri*; яйца Metoponiinae: 17, 18 — *Tyta luctuosa*. Масштабные линейки: 13, 14, 16–18 — 100 мкм; 15 — 10 мкм.

at apical part of egg (fig. 4–5) and rest surface as case bound pigtails (fig. 6). Transverse walls not looked over. Aeropyles clearly expressed. The entire surface of a small, densely placed fiber (fig. 7).

Shape of gnawed holes in eggs. Larva nibbling out round opening at apical area of the egg; only central cover on thin "stem" remained (fig. 1).

Oviposition. Eggs solitary laid.

Acronicta rumicis (Linnaeus, 1758)

Description. Morphologically similar to *Acronicta megacephala* (fig. 8). However, in contrast to previous species micropylar area represented by rosette and 1 row of petalled cells (fig. 9). Rosette with 11–14 cells. There are 20–21 of 54–57 longitudinal ridges radiate from cells of micropylar area. Longest ridges more sharply bent, distinct zigzags (fig. 10–11).

Craniophora ligustri ([Denis et Schiffermüller], 1775)

Description. Morphologically similar to *Acronicta megacephala* and *A. rumicis* (fig. 12–14). However, in contrast to previous species micropylar area represented by rosette and 2–3 rows cells (fig. 15). Rosette with 8–9 cells and 4–5 micropylar openings. There are 25–30 of 66–74 longitudinal ridges radiate from cells of 2–3 rows (fig. 16).

Shape of gnawed holes in eggs. Caterpillars nibble out either a small oval opening at lateral part of egg (fig. 13) or nibble out narrow opening an entire egg perimeter; in latter case central cover on thin "stem" is remained only (fig. 14). If this fragment, all top of chorion falls off.

Oviposition. Eggs solitary laid.

Tyta luctuosa ([Denis & Schiffermüller], 1775)

Description. Egg subspherical (fig. 17), height 0.5 mm, diameter 0.5–0.6 mm (n = = 2). Fresh egg pale yellow with black spot at apical part of egg. As egg develops it becomes pale grey and then grey. Chorion white, translucent.

Chorion ridged, marked on two thirds surfaces. Micropylar area represented by clearly expressed rosette and 1 row faintly expressed long, narrow and pointed petalled cells (fig. 18). Rosette elevated with 9–11 short and wide cells. Walls of cells elevated. (fig. 19). There are 9–10 of 28–29 clearly expressed longitudinal ridges radiate from cells of first row. Transverse ridges weakly expressed (fig. 17–18). The entire surface looks like as sharply expressed shallow network (fig. 20).

Shape of gnawed holes in eggs. Caterpillar nibbles out large oval opening at lateral part of egg (fig. 17).

Cucullia xeranthemi Boisduval, 1840

Description. Egg subspherical (fig. 21), height 0.6–0.7 mm, diameter 0.7 mm (n = = 3). Fresh egg white. As egg develops, it becomes pale pink. Before caterpillar emergence egg becoming grey.

Chorion ridged, marked on two thirds surfaces. Micropylar area clearly expressed, represented by rosette and 3 rows short and broad cells (fig. 22). Rosette and cells of first series have floors with clearly expressed long and narrow ledges (fig. 23). Micropylar rosette elevated with 6–10 cells and 4 micropylar openings (fig. 24). There are 10–13 of 24–25 clearly expressed longitudinal ridges radiate from tertiary cells (fig. 25). Longest ridges with high comb especially in anterior portions (fig. 26). Transverse walls less distinct and narrow than ridges. Aeropyles weakly expressed at walls junctions. The entire surface looks like of shallow network (fig. 27).

Shape of gnawed holes in eggs. Caterpillar nibbles out large oval opening at lateral part of egg (fig. 21).

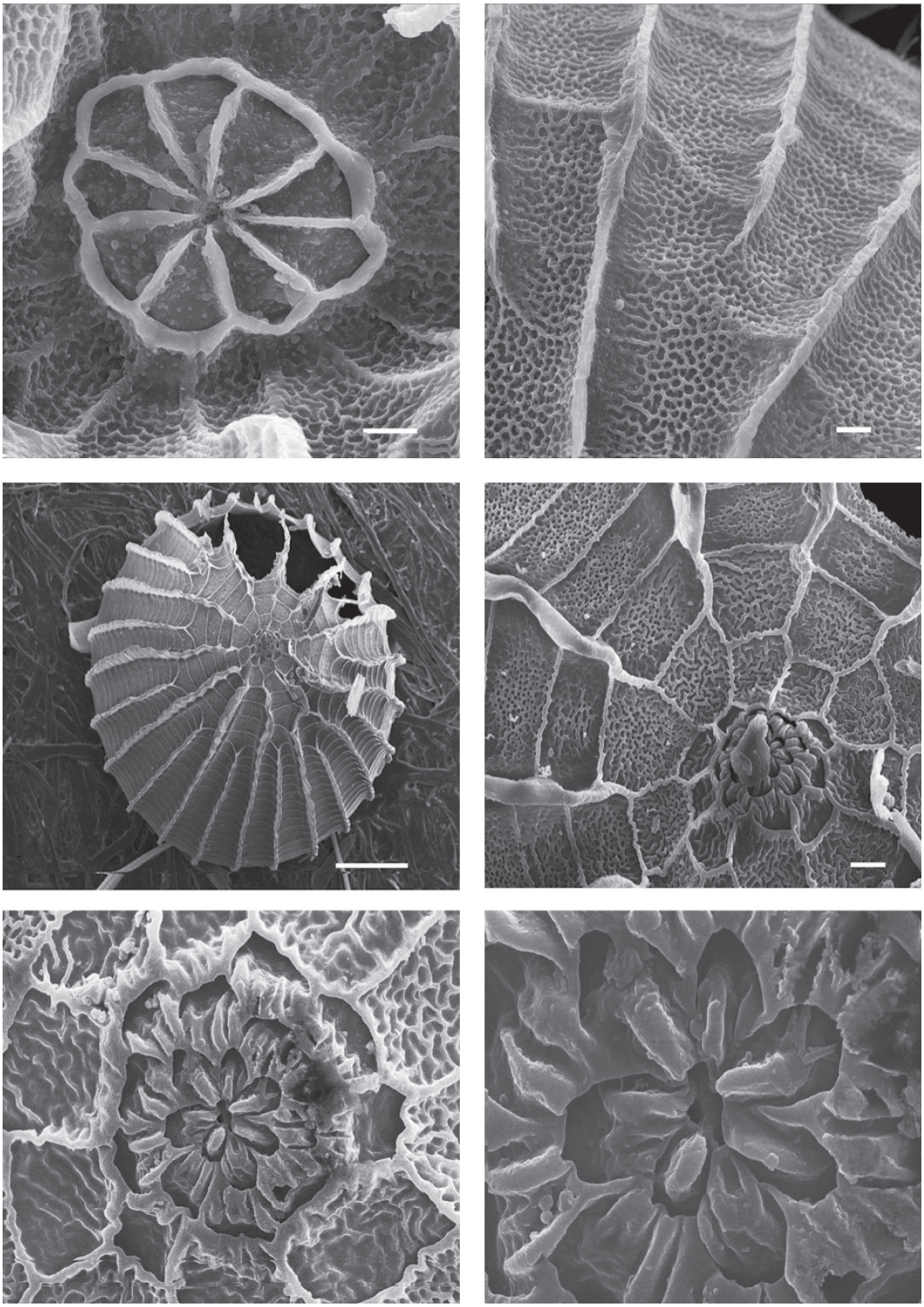

Fig. 19–24. Eggs of Metoponiinae: 19, 20 — *Tyta luctuosa*; eggs of Cuculliinae: 21–24 — *Cucullia xeranthemi*. Scale bars: 21 — 100 μm; 19, 20, 22, 23 — 10 μm; 24 — 1.0 μm.

Рис. 19–24. Яйца Metoponiinae: 19, 20 — *Tyta luctuosa*; яйца Cuculliinae: 21–24 — *Cucullia xeranthemi*. Масштабные линейки: 21 — 100 мкм; 19, 20, 22, 23 — 10 мкм; 24 — 1,0 мкм.

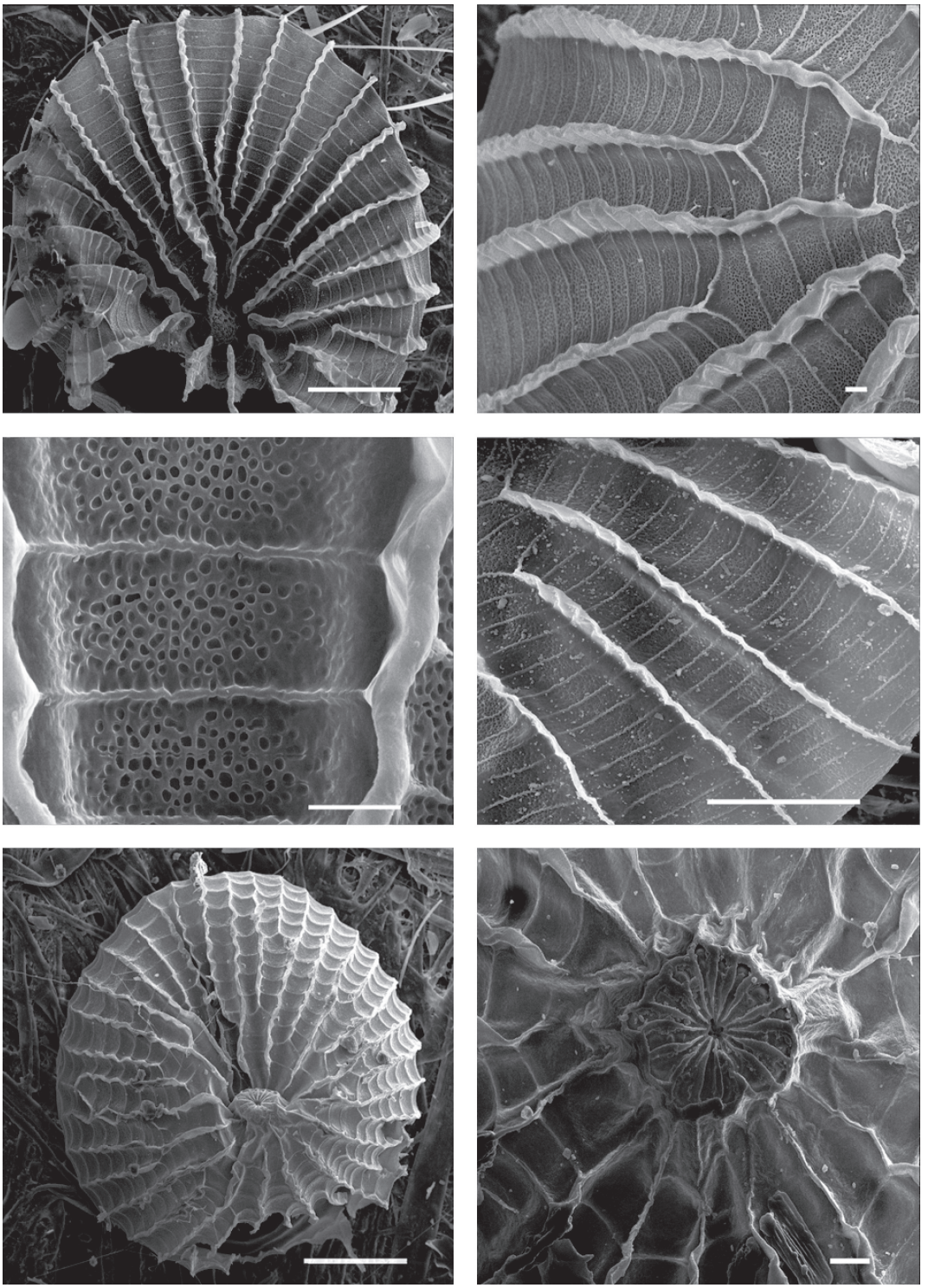

Fig. 25–30. Eggs of Cuculliinae: 25–27 — *Cucullia xeranthemi*; 28 — *Cucullia umbratica*; eggs of Heliothinae: 29, 30 — *Heliothis maritima*. Scale bars: 25, 29 — 100 μm; 26–28, 30 — 10 μm.

Рис. 25–30. Яйца Cuculliinae: 25–27 — *Cucullia xeranthemi*; 28 — *Cucullia umbratica*; яйца Heliothinae: 29–30 — *Heliothis maritima*. Масштабные линейки: 25, 29 — 100 мкм; 26–28, 30 — 10 мкм.

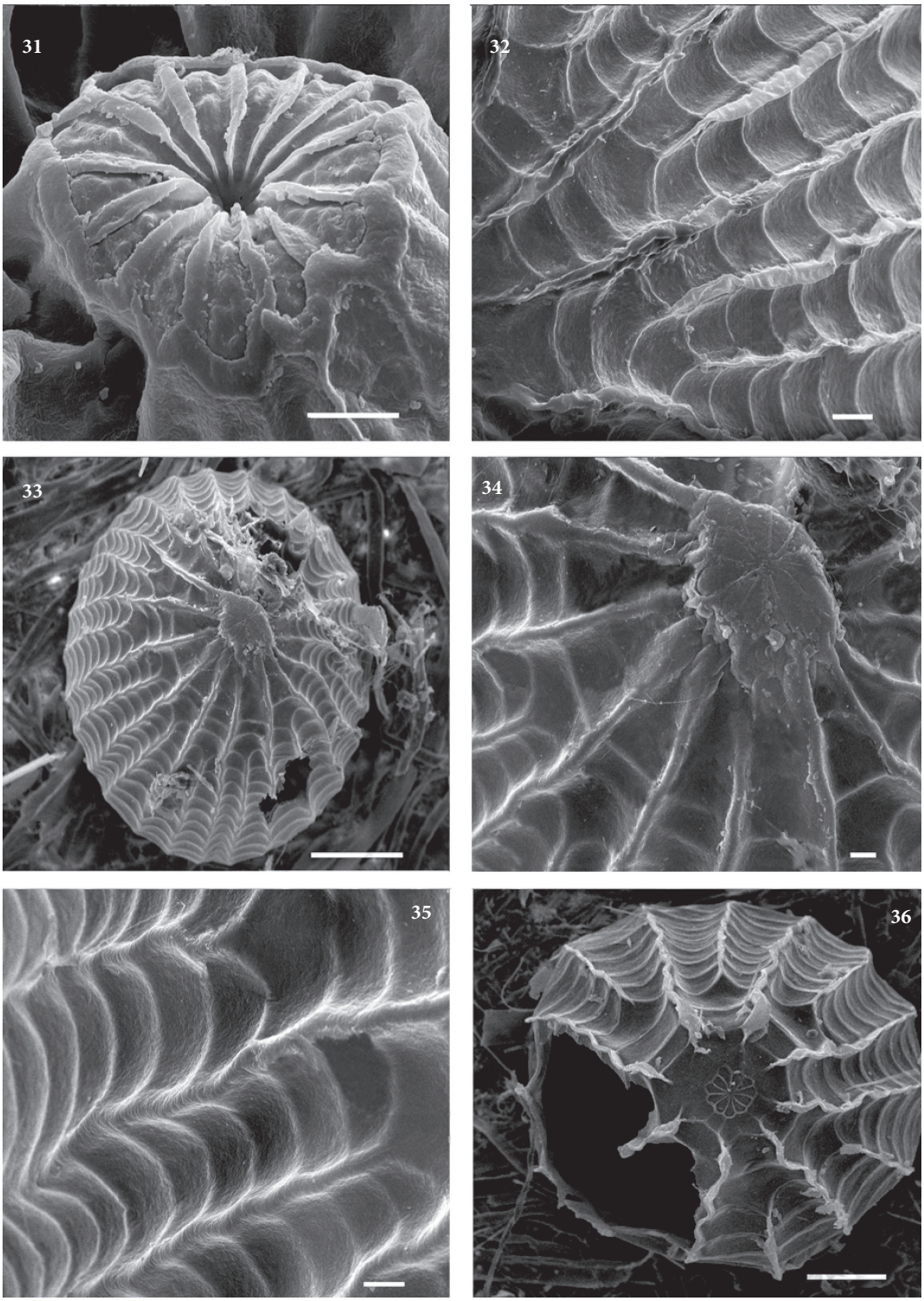

Fig. 31–36. Eggs of Heliothinae: 31–32 — *Heliothis maritima*; 33–35 — *Helicoverpa armigera*; eggs of Condicinae: 36 — *Eucarta amethystina*. Scale bars: 33, 36 — 100 μm. 31, 32, 34–35 — 10 μm.

Рис. 31–36. Яйца Heliothinae: 31–32 — *Heliothis maritima*; 33–35 — *Helicoverpa armigera*; яйца Condicinae: 36 — *Eucarta amethystina*. Масштабные линейки: 33, 36 — 100 мкм; 31, 32, 34–35 — 10 мкм.

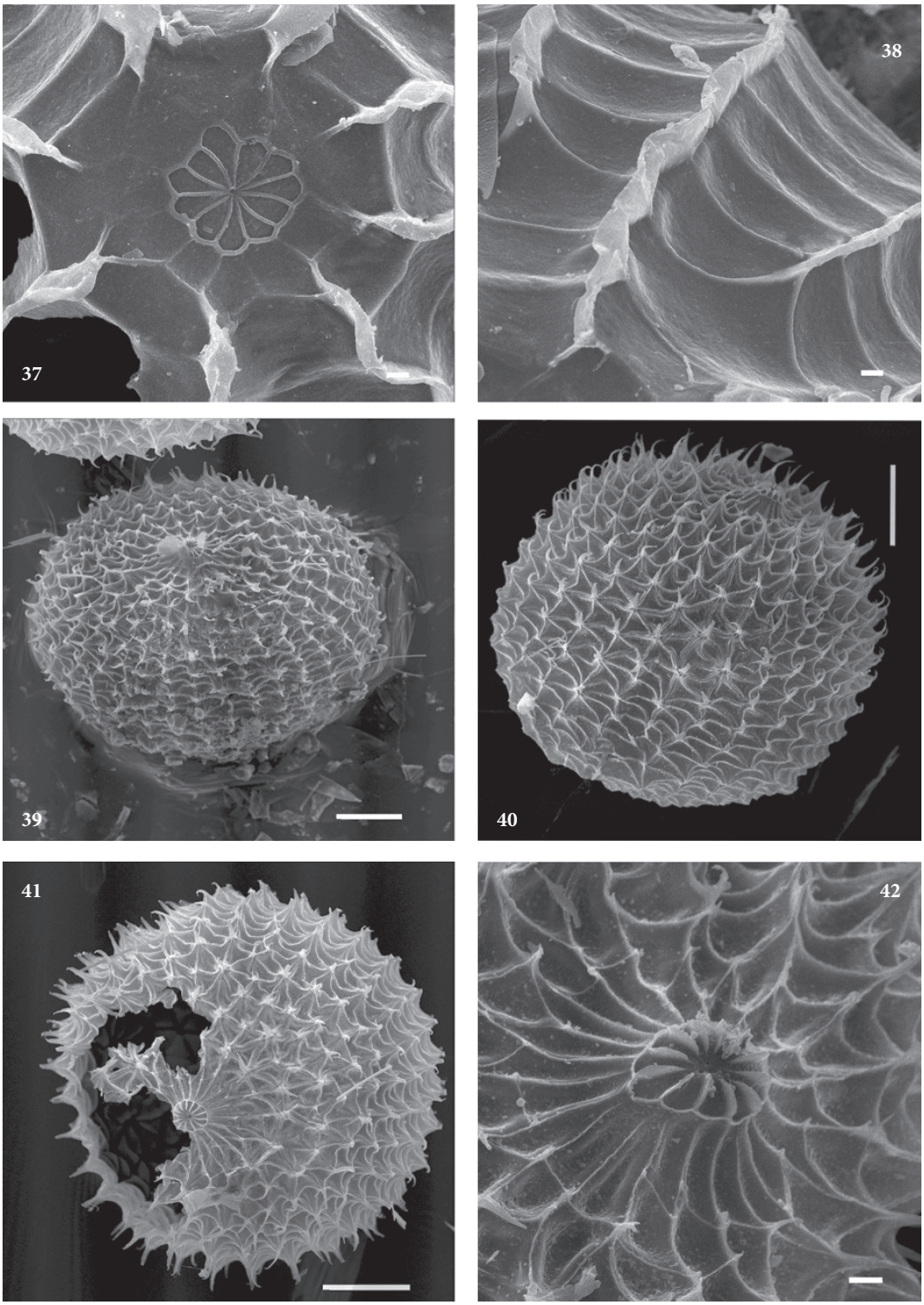

Fig. 37–42. Eggs of Condicinae: 37–38 — *Eucarta amethystina*; eggs of Bryophilinae: 39–42 — *Cryphia fraudatricula*.
Scale bars: 39–41 — 100 μm; 37–38, 42 — 10 μm.

Рис. 37–42. Яйца Condicinae: 37–38 — *Eucarta amethystina*; яйца Bryophilinae: 39–42 — *Cryphia fraudatricula*.
Масштабные линейки: 39–41 — 100 мкм; 37–38, 42 — 10 мкм.

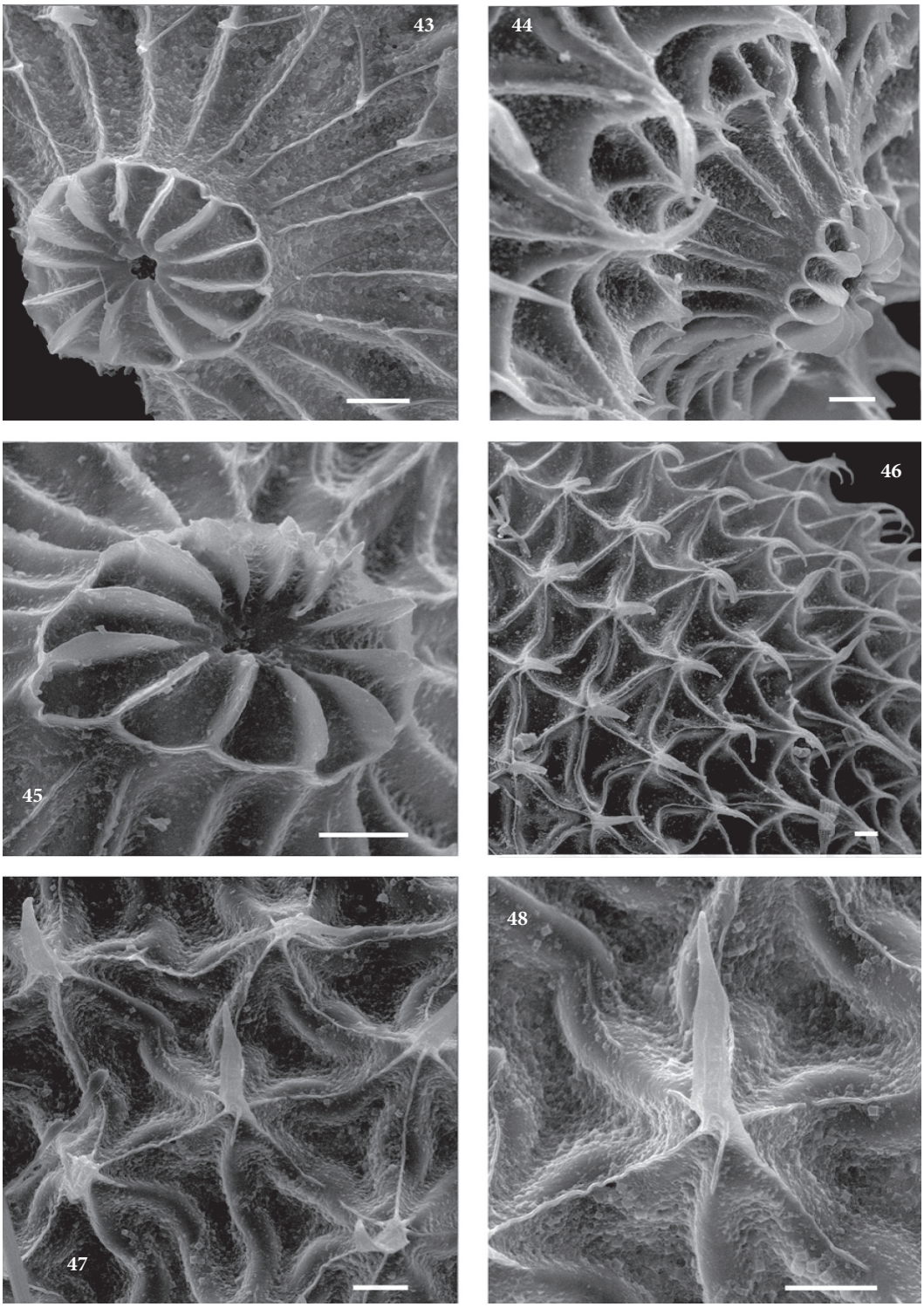

Fig. 43–48. Eggs of Bryophilinae, *Cryphia fraudatricula*: 43–45 — micropylar area; 46 — sculpture of egg chorion; 47 — each of tubercles is surrounded by same 6–7 tubercles; 48 — single tubercle. Scale bars 10 μm.

Рис. 43–48. Яйца Bryophilinae, *Cryphia fraudatricula*: 43–45 — микропилярная область; 46 — скульптура хориона яйца; 47 — каждый туберкул окружен 6–7 туберкулами; 48 — отдельный туберкул. Масштабные линейки 10 мкм.

Oviposition. Eggs solitary laid.

Cucullia umbratica (Linnaeus, 1758)

Description. Egg subspherical. According to E. Döring (1955) diameter 0.75–0.8 mm, height 0.65–0.7 mm. Just laid egg white. As egg develops, it becomes with pink broad patterns. Distinctions from previous species are not discovered (fig. 28). According to E. Döring (1955) there are 15–16 of 32–34 clearly expressed longitudinal ridges radiate from tertiary cells.

Heliothis maritima de Graslin, 1855

Description. Egg subspherical (fig. 29), height 0.4 mm, diameter 0.6 mm (n = 2). Fresh egg citron colour. Chorion white, translucent.

Chorion ridged, marked on two thirds surfaces. Micropylar area represented by rosette and 1 row of weakly expressed cells (fig. 30). Rosette elevated with 15–16 long and narrow cells and 5 micropylar openings. Walls of cells elevated (fig. 31). There are 14 of 36 clearly expressed longitudinal ridges radiate from cells of first row. Longest ridges with high combs especially in apical part (fig. 32). Transverse walls less distinct and narrow than ridges. Aeropyles weakly expressed. The entire surface of small, densely placed fibers.

Shape of gnawed holes in eggs. Caterpillar nibbles out large oval opening at lateral part of egg (fig. 29).

Oviposition. Eggs solitary laid.

Helicoverpa armigera (Hübner, [1808])

Description. Egg subspherical (fig. 33), height 0.3 mm, diameter 0.55 mm (n = 4). Just laid egg have citron colour. Egg becomes pale brown with development. Before caterpillar emergence egg becoming grey, with grey-purple spot in apical part. Morphologically similar to *Heliothis maritima* (fig. 34). However, in contrast to previous species combs on longitudinal edges are not expressed (fig. 35).

Oviposition. Eggs were laid solitary.

Eucarta amethystina (Hübner, [1803])

Description. Egg subspherical (fig. 36), height 0.6 mm, diameter 0.7–0.8 mm (n = 5).

Chorion ridged, marked on two thirds surfaces. Micropylar area represented by rosette and 1 row weakly expressed cells (fig. 37). Rosette with 11–12 long and narrow petalled cells and 4 micropylar openings. Walls of cells elevated. There are 8 of 15 clearly expressed longitudinal ridges radiate from cells of first row. Longest ridges with high combs (fig. 38). Transverse walls less distinct and narrow than ridges. Aeropyles weakly expressed. Chorion faintly pebbled everywhere.

Shape of gnawed holes in eggs. Caterpillar nibbles out large oval opening at lateral part of egg.

Cryphia fraudatricula (Hübner, [1803])

Description. Egg subspherical (fig. 39–41). Egg white.

Chorion not ridged. Micropylar area represented by rosette and 1 row indistinct, long, narrow and pointed cells (fig. 42). Rosette very elevated with 12–13 long and narrow cells (fig. 43–44). Walls of rosette cells flat and strongly elevated, especially in middle part (fig. 45). Sculpture starry, very typical (fig. 46). Pattern looks like high, narrow-angled tubercles, each of which urrounded by same 6–7 tubercles. All tubercles interconnected by bent edges (fig. 47–48).

Oviposition. Eggs solitary laid.

Discussion

The results of this study show that the flattened egg shape is characteristic only for the studied species of the subfamily Acronictinae. The ridged sculpture is occurs in the subfamilies Acronictinae, Metoponiinae, Cuculliinae, Heliothinae and Condicinae. Starry sculpture is found only in *Cryphia fraudatricula* (Bryophilinae).

Diagnostic features of eggs of the studied noctuids:

Acronicta megacephala, *A. rumicis* and *Craniophora ligustri*. Egg flattened.

Larva nibblings out round opening at apical area of egg or narrow opening at entire egg perimeter; in this case central cover on thin "stem" is remained only.

Acronicta megacephala. Micropylar area represented by rosette and 4 rows of cells. There are 30 of 73–76 longitudinal ridges radiating from cells of micropylar area.

Acronicta rumicis. Micropylar area represented by rosette and 1 row of cells. There are 20 of 54–57 longitudinal ridges radiating from cells of micropylar area.

Craniophora ligustri. Micropylar area represented by rosette and 2–3 rows of cells. There are 25–30 of 66–74 longitudinal ridges radiate from cells of micropylar area.

Cucullia xeranthemi, *C. umbratica*, *Tyta luctuosa*. Entire surface shallow network-like.

Cucullia xeranthemi, *C. umbratica*. Micropylar area represented by 3 rows of clearly expressed short and broad cells. Rosette and cells of first series with floors having clearly expressed long and narrow ledges. Longest ridges with high comb especially in anterior portions.

Tyta luctuosa. Micropylar area represented by one row of faintly expressed long, narrow and pointed cells. Rosette and cells of micropylar area with as shallow network-like floors.

Heliothis maritima. Longest ridges with high combs especially in anterior portions.

Helicoverpa armigera. Combs on the longitudinal edges not expressed.

Eucarta amethystina. Only eight of 15 longitudinal ridges. Longest ridges with high combs sharply rising above micropylar area.

Cryphia fraudatricula. Chorion not ridged. Sculpture stellar.

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